Project Final Report

Submitted to

National Oceanic and Atmospheric Administration
Office of Global Programs
(Jin Huang, Program Manager)

Research Project Figures
"A Hydrologic Ensemble Seasonal Forecast System over the Eastern U.S."
(Grant NA17RJ2612)

April 21, 2008

Principal Investigator:
Eric F. Wood
Department of Civil and Environmental Engineering
Princeton University
Princeton NJ -8540
Email: efwood@princeton.edu

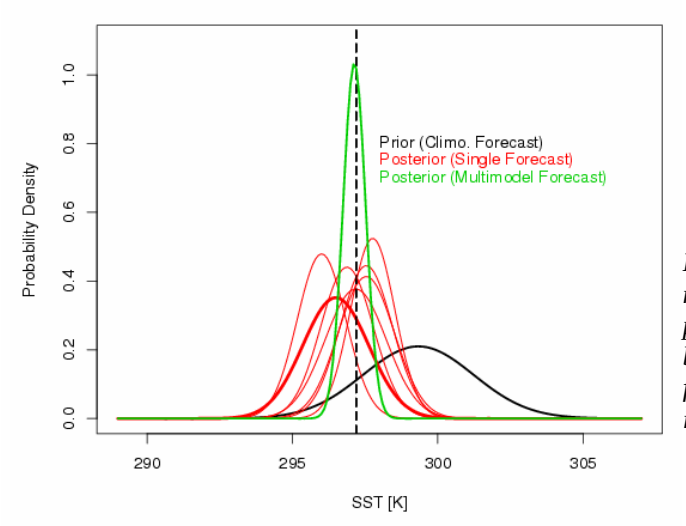

Figure 1: The prior distribution (solid black), single model posterior forecasts (red) and the multi-model posterior forecast (green) for a forecast of SST of 1 grid box over the Nino 3.4 region. The ECMWF DEMETER forecasts are used here. The vertical dashed line indicates the actual observation for that forecast.

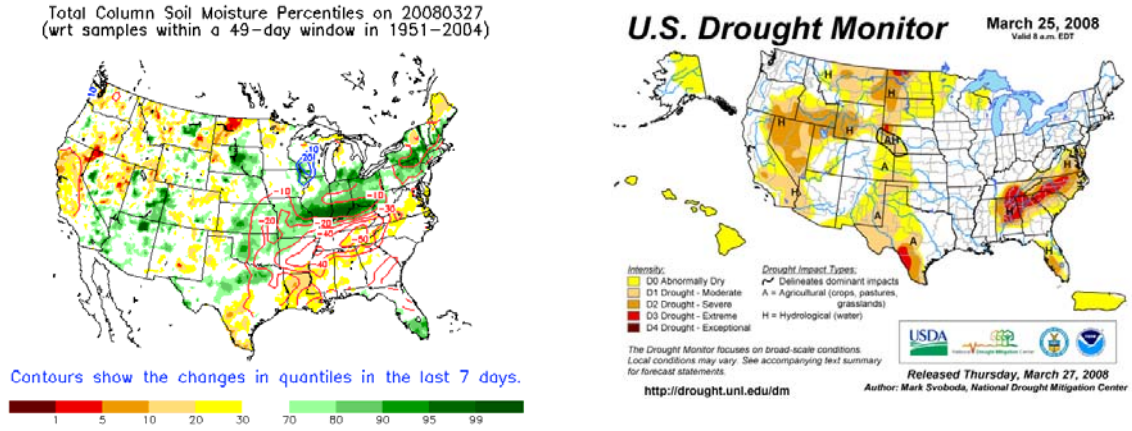

Figure 2 Real-time drought monitoring using VIC and NLDAS compared with official NOAA drought monitor.

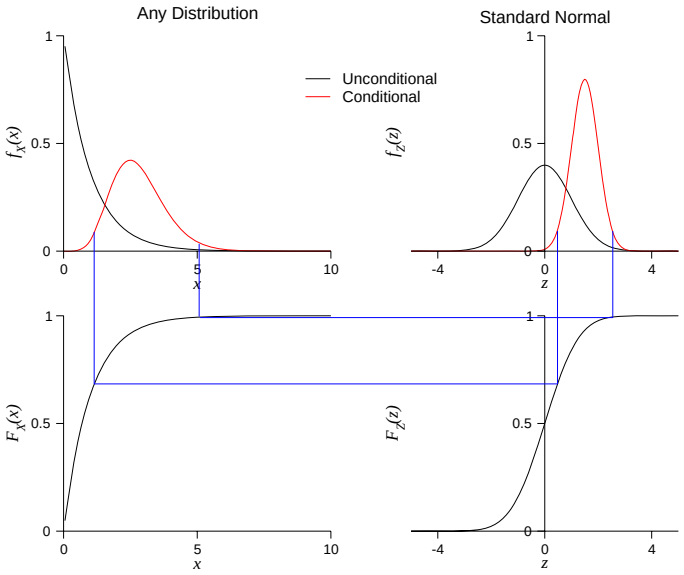

Figure 3: Transfer of a non-normal distribution to and back from a standard normal distribution. The thick black lines in the left panels are for the non-normal distribution (climatology) of the variable of interest (PDF on the top and CDF at the bottom), and the thick black lines in the right are for the standard normal. Dashed lines running across show how data values can be transferred back and forth using the equal-quantile principle. Thin black lines (labeled with "Conditional") represent the resulted posterior distribution in the Bayesian merging and how they are converted back to the variable's original climatology space.

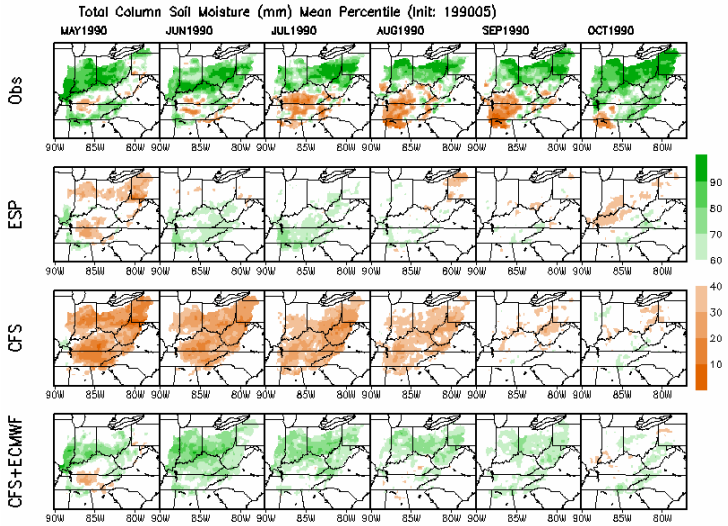

Figure 4: A six-month soil moisture forecast initiated at May 1990, over the Ohio River basin from three types of forecast 1) climatologic forecast (ESP, the second row, 2) CFS-based Bayesian forecast (CFS, the third row), and 3) multiple climate model-based Bayesian forecast (CFS+DEMETER, fourth row).

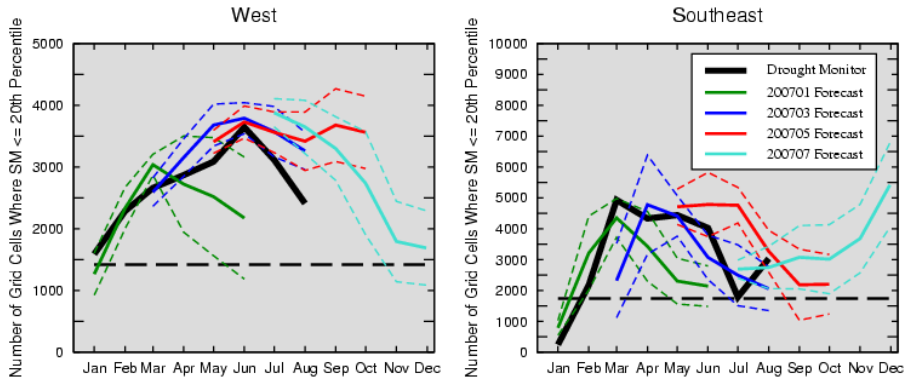

Figure 5 Prediction of drought affected area over West and Southeast US during early 2007.

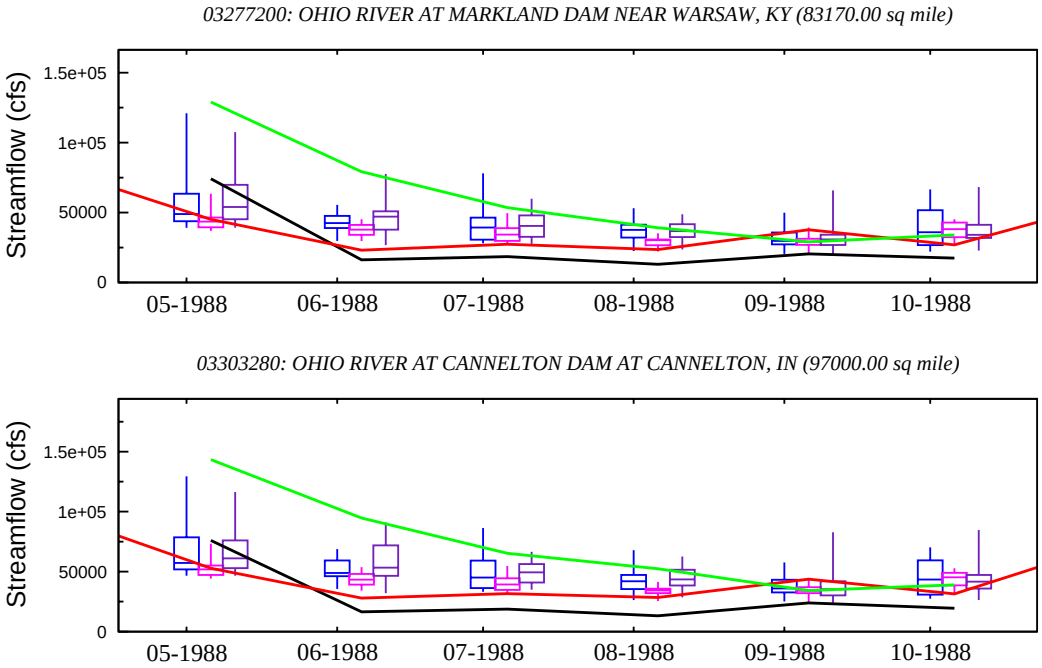

Figure 6 Comparison of streamflow predictions from three forecast approaches. The green, black and red curves are climatology, observation and offline simulation, respectively. Three box-whisker plots are CFS, CFS+DEMETER and ESP from left to right.

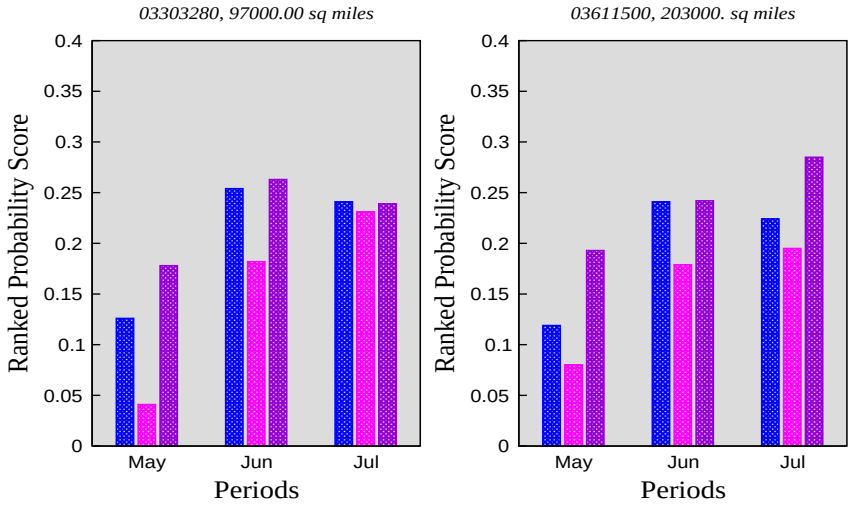

Figure 7 The evaluation of streamflow predictions over selected gauges in the Ohio River basin. The ranked probability score (RPS) for monthly streamflow for the first three months are examined against the offline simulation. The bars are for three forecast approaches, CFS, CFS+DEMETER and ESP from the left to the right in each group, respectively. CFS and CFS+DEMETER are the Bayesian merging approaches developed in this project, and they provide the better forecast skill than the traditional ESP forecast approach.